

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of the Investigation of)
HAWAIIAN ELECTRIC COMPANY, INC.;)
HAWAII ELECTRIC LIGHT COMPANY, INC.;)
and MAUI ELECTRIC COMPANY, LIMITED)
Related to the Major Power Outages of)
October 15-16, 2006.)

DOCKET NO. 2006-0431

DECISION AND ORDER

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DEPT. OF COMMERCE AND
CONSUMER AFFAIRS
STATE OF HAWAII

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OF THE STATE OF HAWAII

HAWAIIAN ELECTRIC COMPANY, INC.;)
HAWAII ELECTRIC LIGHT COMPANY, INC.;)
and MAUI ELECTRIC COMPANY, LIMITED)

Related to the Major Power Outages of)
October 15-16, 2006.)

DECISION AND ORDER

By this Decision and Order, the commission determines that HAWAIIAN ELECTRIC COMPANY, INC. ("HECO"); HAWAII ELECTRIC LIGHT COMPANY, INC. ("HELCO"); and MAUI ELECTRIC COMPANY, LIMITED's ("MECO") (collectively, the "HECO Companies") activities and performance prior to and during the major power outages that occurred on the islands of Oahu, Hawaii, and Maui on October 15-16, 2006 ("Power Outages") were reasonable and in the public interest. The commission concludes that no penalties are warranted.

I.

Background

HECO, HELCO, and MECO are Hawaii corporations and public utilities as defined by Hawaii Revised Statutes ("HRS") § 269-1 and, thus, are subject to commission jurisdiction under Chapter 269, HRS.

HECO, a wholly-owned subsidiary of Hawaiian Electric Industries, Inc., is engaged in the production, purchase, transmission, distribution, and sale of electricity on the island of Oahu in the State of Hawaii ("State").¹ HELCO, a wholly-owned subsidiary of HECO, is engaged in the production, purchase, transmission, distribution, and sale of electricity on the island of Hawaii.² While, MECO, also a wholly-owned subsidiary of HECO, is engaged in the production, purchase, transmission, distribution, and sale of electricity in the County of Maui which consists of the islands of Maui, Molokai, and Lanai.³

A.

Procedural History

On Sunday, October 15, 2006, at or about 7:07 a.m., the State experienced a 6.7-magnitude earthquake west of the island of Hawaii, which initiated a series of events that resulted in island-wide power outages on Oahu and Maui and significant outages on the island of Hawaii.⁴

¹HECO was initially organized under the laws of the Kingdom of Hawaii on or about October 13, 1891.

²HELCO was initially organized under the laws of the Republic of Hawaii on or about December 5, 1894.

³MECO was initially organized under the laws of the Territory of Hawaii on or about April 28, 1921.

⁴A number of smaller earthquakes occurred after the initial 6.7-magnitude earthquake, which was reported to have been centered off of the Kona coast of the island of Hawaii.

On Thursday, October 19, 2006, at the request of the commission, the HECO Companies briefed the commission and the DIVISION OF CONSUMER ADVOCACY, DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS ("Consumer Advocate")⁵ on their initial assessments of the Power Outages ("Commission Briefing"). During the Commission Briefing, the HECO Companies provided a preliminary description of the Power Outages and the restoration processes utilized. According to the HECO Companies, power was restored to a majority of the customers on Oahu by approximately 1:55 a.m. on October 16, 2006, with pocket outages identified and addressed throughout the morning and into the night. On Maui, service to a majority of MECO's customers was restored by approximately 1:15 p.m. and the remaining customers by 2:07 p.m. on October 15, 2006. On the island of Hawaii, service was restored to a majority of HELCO's affected customers by 12:00 noon, with the remaining customers restored service by 11:00 p.m., on October 15, 2006.

On Monday, October 23, 2006, the HECO Companies held a public briefing regarding the Power Outages ("Public Briefing") in which they reiterated their preliminary findings regarding the causes of the outages and the processes used for restoring power

⁵The Consumer Advocate is statutorily mandated to represent, protect, and advance the interests of all consumers of utility service and is an ex officio party to all proceedings before the commission. See HRS § 269-51 and Hawaii Administrative Rules ("HAR") § 6-61-62.

to their customers. In addition, members of the public were given an opportunity to express their concerns and address questions to representatives of the HECO Companies.

During the Public Briefing and by letter dated and filed on October 23, 2006, the Consumer Advocate requested that the commission open an investigative docket to examine whether the HECO Companies acted reasonably and in the public interest prior to and during the Power Outages. Subsequently, by letter dated and filed on October 27, 2006, the HECO Companies informed the commission that they do not object to the opening of separate investigative dockets for each company.⁶

By Order No. 22986, filed on October 27, 2006 ("Order No. 22986"), the commission initiated this investigation to examine the HECO Companies' conduct related to the Power Outages.⁷ In Order No. 22986, the commission named HECO, HELCO, MECO, and the Consumer Advocate, as parties to this proceeding⁸; and, among other things, required the Parties to submit a proposed stipulated procedural order for the commission's review and approval. On November 8, 2006, Life of the Land ("LOL") filed a Motion to Intervene in this

⁶The Consumer Advocate submitted a letter on the same day stating that it does not object to the HECO Companies' request for separate investigative proceedings for each company.

⁷This investigative docket was initiated pursuant to HRS §§ 269-7 and 269-15; and HAR § 6-61-71.

⁸The HECO Companies and the Consumer Advocate are hereafter referred to as the "Parties."

docket pursuant to HAR § 6-61-55 ("LOL's Motion to Intervene")⁹ which the commission denied.¹⁰

On December 8, 2006, the Parties submitted their proposed stipulated procedural order pursuant to Order No. 22986. By Order by 23155, issued on December 21, 2006, the commission approved the Parties' proposed stipulated procedural order, with a modification ("Procedural Order"). Consistent with the Procedural Order, the Parties took part in technical meetings, conducted discovery, and filed written position statements regarding the matters of this docket.

In addition, the HECO Companies filed the results of investigations conducted by POWER Engineers, Inc., ("POWER"), the mainland-based industry experts retained by the HECO Companies to investigate the Power Outages as follows: (1) the Investigation of 2006 Oahu Island-Wide Power Outage ("HECO POWER Report"), filed on December 28, 2006; and (2) the Investigation of 2006 Hawaii Island Power Outage, filed on March 30, 2007; and (3) the Investigation of 2006 Maui Island-Wide Power Outage ("MECO POWER Report"), filed on March 30, 2007 (collectively, "POWER Reports").¹¹

⁹On November 16, 2006, the HECO Companies timely filed their Memorandum in Opposition to LOL's Motion to Intervene.

¹⁰See Order No. 23097, filed on December 1, 2006, in this docket.

¹¹The HECO Companies also submitted reviews of their external communications which accompanied their respective outage reports ("External Communications Reviews"); and filed their Outage and Restoration Comparison report on March 30, 2007.

Moreover, on August 3, 2007, the HECO Companies filed their Preliminary Statement of Position ("Preliminary SOP"). The Consumer Advocate filed its Statement of Position ("CA's SOP") on August 24, 2007, and the HECO Companies submitted their Final Statement of Position ("Final SOP") on October 26, 2007.

Subsequently, on December 4, 2007, the HECO Companies conducted a briefing regarding their training programs ("December 2007 Briefing"). By letter dated January 23, 2008, the HECO Companies documented the matters and materials reviewed during the December 2007 Briefing. On September 19, 2008, the Consumer Advocate submitted a letter ("CA's Supplement") acknowledging its participation in the December 2007 Briefing and clarifying its position.

B.

Issues

The issues in this docket, as set forth in the Procedural Order, are:

1. Aside from the earthquake, are there any underlying causes that contributed or may have contributed to the Power Outages?
2. Were the activities and performances of the HECO Companies prior to and during the Power Outages reasonable and in the public interest? Specifically, were the power restoration processes and communication regarding the outages reasonable?

3. Could the island-wide Power Outages on Oahu and Maui have been avoided? What are the necessary steps to minimize and improve the response to such occurrences in the future?
4. What penalties, if any, should be imposed on the HECO Companies?

C.

Summary of Positions

1.

HECO Companies' Position

The HECO Companies engaged POWER, which is comprised of "experts in power delivery systems and generation plant design and operation, to investigate the causes"¹² of the Power Outages. POWER was also tasked to provide its professional opinions regarding the reasonableness of the responses of the HECO Companies' staff during the earthquake and restoration periods.

The HECO Companies state that POWER found that they were "appropriately staffed; reacted to the circumstances in a reasonable, responsible, and professional manner; undertook critical and prudent decisions in the course of restart[ing] their systems, as required; and followed a systematic, orderly, and methodical approach to add customer load to their respective systems."¹³ Along with its findings, POWER proposed various

¹²See Preliminary SOP at 10.

¹³Id. at 11-12 (references omitted).

recommendations to mitigate the risk of future occurrences under similar situations.

According to the HECO Companies, the record of this proceeding is clear that they acted responsibly, prudently, and in the public interest prior to and during the earthquake, and during the respective outages on each island. They also submit that no penalties should be assessed.

Moreover, the HECO Companies state that the necessary steps to minimize and to improve their response to similar future occurrences are "answered" through POWER's recommendations which they intend to adopt and implement. However, with regard to the recommendations suggested by the Consumer Advocate, the HECO Companies state that they: (1) disagree with the Consumer Advocate's assessment of their training programs; and (2) are committed to achieving the intent of the other recommendations, "as far as practicable." The Consumer Advocate's concerns and recommendations, and the HECO Companies' positions regarding them will be discussed in the appropriate sections below.

Further, the HECO Companies note that it would be "impracticable to have, as a stated goal, the total prevention of any future island-wide blackout since that level of reliability would require layers of redundancy in all aspects of

the Companies' respective systems, at an inordinate cost to customers."¹⁴ They contend that situations may occur in the future that are totally beyond the control of the utility (e.g., natural disasters, such as severe hurricanes, tsunamis, catastrophic earthquakes, and volcanic eruptions) which prevent the HECO Companies from guaranteeing absolute and uninterrupted service. However, the HECO Companies assert that they are "confident that their existing facilities, training and planned improvements, both in progress and planned for the future, result in effective emergency response preparedness for a full range of potential system disturbances."¹⁵

In closing, the HECO Companies state that the investigative process was thorough and that they are committed to implementing the intent of the proposed recommendations, as far as practicable. Moreover, the HECO Companies represent that the intent of this investigation has been fully satisfied and request that this docket be closed.

¹⁴Id. at 12.

¹⁵See Final SOP at 7.

Consumer Advocate's Position

The Consumer Advocate retained the services of a consultant, Sega, Inc. ("Sega") to provide expert assistance during its independent investigation of the activities and performances of the HECO Companies.¹⁶ In sum, the Consumer Advocate states that:

- (1) There are at least three main underlying causes that contributed or may have contributed to the Power Outages occurring and potentially lengthening the recovery duration;
- (2) The HECO Companies' activities and performance prior to and during the Power Outages were reasonable and in the public interest;
- (3) The island-wide Power Outages could not have been avoided on Maui and were understandable on Oahu; and
- (4) The HECO Companies should not be assessed penalties for these uncommon island-wide outages.¹⁷

Moreover, the Consumer Advocate states that Sega reviewed POWER's recommendations, as set forth in the POWER Reports, concurs with each recommendation proposed, and also agrees with the recommendations contained in the External Communications Reviews. Moreover, the Consumer Advocate

¹⁶The Consumer Advocate asserts that the positions in its SOP are based "upon consultation with Sega and in reliance on the final report of Sega[.]" See CA's SOP at 2.

¹⁷See CA's SOP at 2.

recommends three additional measures to minimize and improve the HECO Companies' response to future similar occurrences.

Specifically, the Consumer Advocate recommends that:

- (1) The HECO Companies "should develop and utilize a well documented, comprehensive training program for all plant and systems operation personnel, which include rigorous formalized training with testing for certification to positions, practice resolving critical conditions on training simulators, and periodic proficiency examinations and re-certifications."¹⁸
- (2) "HECO evaluate and pursue providing Waiau 9 and 10 combustion turbines with specific black start capability by adding a black start diesel generator set."¹⁹
- (3) HECO develop and begin a long-term program to implement Supervisory Control and Data Acquisition ("SCADA") control on existing distribution breakers. Moreover, the HECO Companies should implement a standard requiring SCADA control for all new distribution breakers that are installed on all three islands.²⁰

In its Supplement, the Consumer Advocate states that it "believes that the purpose of this investigative proceeding has been satisfied."²¹

¹⁸Id. at 27.

¹⁹Id. at 21.

²⁰Id. at 22.

²¹See CA's Supplement at 3.

II.

Discussion

A.

Aside from the earthquake, are there any underlying causes that contributed or may have contributed to the Power Outages?

1.

Summary of Parties' Positions

a.

HECO Companies' Position

On the issue of whether, aside from the earthquake, there were any underlying causes that contributed or may have contributed to the Power Outages, POWER determined that the Power Outages were a "direct and proximate" result of the earthquakes of October 15, 2006. Upon investigation, POWER found, among other things, that at or about the time the first earthquake struck, all three utility systems were in proper operating conditions and were appropriately staffed.

Specifically, with regard to Oahu, POWER stated that "[t]he main underlying cause of the island-wide outage was the earthquake which resulted in the false operation of OEM-installed mercury switches in the K[ah]e5 and K[ah]e6 Electro-Hydraulic systems that locked out the operation of the hydraulic pumps[.]"²²

²²See HECO POWER Report at 81.

According to POWER, the control schemes of Kahe 5 and 6 prevented the pumps from re-starting. The electro-hydraulic system lockouts resulted in the eventual loss of both generating units. POWER determined that the loss of Kahe 5 and 6 was the primary cause of the system frequency decay to below 58 hertz, triggering the automatic underfrequency load shedding that ultimately resulted in the island-wide outage on Oahu.

For HELCO, POWER concluded that the underlying cause of the outage on the western side of the island of Hawaii was the earthquake acting on transmission protection scheme auxiliary relays that tripped HELCO's transmission lines and separated portions of HELCO's system. POWER also stated that the Hamakua Energy Partners' power plant was "islanded" due to the transmission line trips and that at various substations pressure protection schemes activated lockouts and primary fuses were opened.

For MECO, POWER determined that the main underlying cause of the outage was the earthquake which triggered vibration sensors tripping two of MECO's generators, Maalaea 14 and 16, at its Maalaea power plant. According to POWER, the loss of these generators initiated a series of events (through the operation of automatic relays and operators' actions to protect the equipment) that resulted in the sequential loss of generation and the eventual shutdown of MECO's system.

While POWER did not specifically pinpoint any other underlying factors, it proposed various recommendations for each utility to mitigate the risk of future occurrences under similar circumstances. With the caveat "that no system event will ever be identical to the one before it,"²³ POWER offered specific recommendations for HECO, HELCO and MECO (numbering nine, five, and four, respectively) to, as stated with regard to HECO, "reduce the likelihood of a repeat of the system blackout of October 15, 2006 due to similar circumstances, speed up the restoration of electricity to consumers in the event of a similar blackout, and reduce the risk of equipment damage in the event of serious system disturbance."²⁴

The HECO Companies agree with POWER's findings and recommendations. According to the HECO Companies, "[e]ach of the three Hawaiian Electric Companies is actively addressing the recommendations of POWER, and each Company is implementing other practical system improvements and operating practices that are best suited to meet the unique circumstances and needs of each of the island grids."²⁵ The HECO Companies' response to each of POWER's recommendations is set forth on pages 26 through 42 of their Final SOP.

²³Id. at 2.

²⁴Id. at 87.

²⁵See Preliminary SOP at 12.

b.

Consumer Advocate's Position

The Consumer Advocate argues that there were at least three main underlying causes that contributed or may have contributed to the Power Outage occurring and possibly to the duration of the recovery processes. First, the Consumer Advocate contends that the primary underlying cause of the island-wide outage on Oahu was due to the reaction of the electro-hydraulic control system low fluid level mercury switches to the earthquake's seismic vibrations and their relays locking out the system. According to the Consumer Advocate, while the mercury devices were designed to protect the control systems that regulate steam flow, the seismic vibrations caused the mercury switches to activate, locking out the electro-hydraulic pumps from operating to pressurize the system, causing the steam valves to close, and tripping Kahe 5 and 6 during a crucial period when other units were shutdown. The Consumer Advocate states that Sega agrees with the HECO Companies and POWER that the trips on Kahe 5 and 6 created a "cascade" of events from which HECO was unable to recover. The Consumer Advocate contends that "this phenomenon was not understood or expected by HECO" since these switches and lockouts, "which were part of

the original equipment manufacturer's supply, had apparently not activated in this manner during previous seismic events."²⁶

Second, the Consumer Advocate asserts that the HECO Companies' "training programs for plant and system operators lack formalized testing, practiced simulation, certification, re-qualification, and record keeping", which may have contributed to the Power Outages on Oahu and Maui, and delayed the restoration of power to the two islands.²⁷ While the Consumer Advocate recognizes that the HECO Companies presently utilize a line-of-progression ("LOP")/on-the-job training ("OJT") program for all operating employees and refresher training, the Consumer Advocate states that HECO Dispatch Center personnel are not administered proficiency evaluations and that MECO Production Departments lack a formal re-qualification program. Moreover, the Consumer Advocate notes that: (1) Sega was unable to discover formal retesting for re-qualifying positions for other operating staff of the HECO Companies; (2) HECO was unable to provide the Consumer Advocate with an implementation schedule for the new computer based training program; (3) specific training records are not kept and no proficiency evaluations are

²⁶See CA's SOP at 11.

²⁷Id.

performed; (4) HECO's Production Department Operating Division Policy Manual ("ODPM") in force at the time of the earthquake was not updated since September 24, 1992; and (5) HECO's Incident Response Manual ("IRM") was last updated on October 2, 2003.

While noting that in Sega's opinion, "the HECO Companies' Operations Staff did the best they could to prevent the island-wide blackouts and to recover from them considering the circumstances and the training they had received[,] "²⁸ the Consumer Advocate appears to pinpoint certain occurrences during the outages alluding to shortcomings in training. Accordingly, the Consumer Advocate recommends that the HECO Companies "develop and utilize a well documented, comprehensive training program for all plant and systems operation personnel, which include rigorous formalized training with testing for certification to positions, practice resolving critical conditions on training simulators, and periodic proficiency examinations and re-certifications."²⁹ Moreover, the Consumer Advocate contends that HECO's ODPM and IRM be updated "at least annually" and utilized as the basis of training programs.

²⁸Id. at 13.

²⁹Id. at 27.

Third, the Consumer Advocate contends that HECO's specific generation mix, consisting primarily of steam turbine generators as opposed to quick-start combustion turbine ("CT") generators, did not permit it to start its units to prevent the island-wide blackout and contributed to the length of the restoration period. According to the Consumer Advocate, aside from several small distribution generators, HECO's generating fleet, which evolved over time to economically serve Oahu's load, does not have quick starting units. The Consumer Advocate notes that approximately ninety-one percent of HECO's generating plants are oil-fired steam units which have been in service for an average of about forty-two years (which, according to Segal, may typically require four to six hours to start up) and that only two of HECO's generating units (Waiau 9 and 10) are CTs that can normally be started within thirty minutes.³⁰ The Consumer Advocate states that without quick starting generating units which can be brought up to full load in ten minutes or less, "HECO had no units that could effectively

³⁰The Consumer Advocate states that the economics of fuel costs for steam plants, which burn low sulfur fuel oil versus CTs, which burn more expensive diesel fuel, impact the type of generating plants that HECO selected and the manner in which they are operated. The Consumer Advocate also notes that HECO's "steam plants are inherently much slower and can be somewhat temperamental to start and reload relative to combustion turbine or internal combustion engines like those used by HELCO or MECO." See CA's SOP at 19-20 (internal quotes and reference omitted).

offset the loss of its Kahe 3, 5 and 6, and Honolulu 8 generating plants to prevent the blackout."³¹ However, "[g]iven [that] HECO's annual system load factors in the 70 percent range[,] the Consumer Advocate states "that a sufficient number of such quick starting units to counteract the loss of these units' 432 MW [(megawatts)] total generating capacity would likely prove to be an uneconomical generating mix for Oahu[.]"³² Nonetheless, noting that HECO does not have black start capability for its existing CTs but is planning on adding 110 megawatts ("MW") of black start capability with the addition of the Campbell Industrial Park ("CIP") CT in 2009, the Consumer Advocate recommends that HECO evaluate and pursue providing its Waiau 9 and 10 CTs with specific black start capability by adding a black start diesel generator set.

c.

HECO Companies' Response

The HECO Companies disagree with Sega and the Consumer Advocate's assessment of their training programs. They state that the Consumer Advocate's assertion that the HECO Companies do not have formalized training programs for power plant and system operators is "misguided." According to

³¹Id. at 20.

³²Id.

the HECO Companies, they have established standards for qualification for each operating position in the power plants and dispatch center. They contend that power plant and system operators receive extensive training in a variety of disciplines and through a multitude of methods; and that they are "committed to continuously improve the formality, proficiency testing and associated documentation, of its structured operator qualification process."³³ The HECO Companies assert that their fundamental objective is that every one of their power plant and system operators (including their frontline supervisors) be fully qualified and highly competent in their job functions and responsibilities. Moreover, the HECO Companies acknowledge that training programs are not static and, assert that they periodically review, revise and supplement their respective training programs, as appropriate. To demonstrate the extent and depth of their training programs, the HECO Companies provide a discussion of each companies' training program on pages 66-104 of their Final SOP, which is supported and expanded upon in Attachments 1-52 of the same document.

According to the HECO Companies, the likely reasons for the disagreement regarding the adequacy of their training programs are "that Sega was not fully informed by the Companies

³³See Final SOP at 64.

during the course of these proceedings and did not fully appreciate the Companies' respective comprehensive, rigorous, and well documented training programs for all power plant and System Operation personnel."³⁴ To supplement the information set forth in the Final SOP and attachments, the HECO Companies invited Sega, the Consumer Advocate, and the commission to inspect a representative collection of their extensive training materials and structured practical training.³⁵ However, with respect to the Consumer Advocate's recommendation regarding HECO's manuals, the HECO Companies acknowledge and agree that the ODPM and IRM should be reviewed annually and updated as appropriate.

Lastly, with respect to system restoration from a blackout, the HECO Companies state that they agree with the intent of the Consumer Advocate's recommendation that HECO add a second site for "quick-starting" power restoration and the benefits to be gained by distributing one-hour restoration capability between two sites and three equipment trains. However, they assert that POWER's recommendation to assess and

³⁴Id. at 4.

³⁵This "inspection" of training materials occurred on December 4, 2007 (i.e., the December 2007 Briefing). Representatives of the Consumer Advocate and commission took part in the December 2007 Briefing; however, Sega, the Consumer Advocate's expert, was not present. See CA's Supplement at 2.

utilize, if feasible, Kalaeloa Partners LP's ("Kalaeloa")³⁶ combined cycle block to permit its large CTs to re-energize "black" transmission circuits (the "Kalaeloa Option"),³⁷ provides a more cost-effective and sensible alternative than the Consumer Advocate's recommendation to add new black-start capability to HECO's Waiau 9 and 10 ("Waiau Option").

According to HECO, there are various factors that make the Kalaeloa Option the more sensible alternative. First, the two Kalaeloa CTs are "based loaded" (meaning that at least one of the two trains operate continuously, more or less) and, thus, likely to be operating at the time of any serious system event. Second, the Kalaeloa Option is more cost-effective. According to the HECO Companies, the preliminary cost estimate to implement the Kalaeloa Option is within the range of approximately \$180,000 while the estimate to implement the Waiau Option is within the range of approximately \$2,150,000, roughly twelve times more. Finally, implementation of the Kalaeloa Option would provide HECO with greater diversity and flexibility by allowing HECO to restore power to Oahu, in the event of a blackout, from four separate power generating sites

³⁶Kalaeloa is one of three independent power producers that provide generation to HECO's system. See Preliminary SOP at 14.

³⁷The Kalaeloa Option is the third recommendation that POWER proposed for HECO ("POWER's HECO Recommendation No. 3"). See HECO POWER Report at 87-88.

(i.e., Kalaeloa, CIP, Waiau, and Kahe stations) as opposed to three under the Waiau Option. The HECO Companies note that: (1) HECO has begun discussions with Kalaeloa regarding POWER's HECO Recommendation No. 3; (2) Kalaeloa expressed support for exploring this option; and (3) preliminarily, the Kalaeloa Option appears to be technically feasible. The HECO Companies conclude that "[w]ith no clear and substantial benefits to be accrued by installing black-start capability for the aging Waiau combustion turbines at considerable higher expense, HECO proposes instead to continue its efforts . . . to assess and if feasible, implement the use of the Kalaeloa combustion turbines to re-power "black" transmission circuits."³⁸

2.

Analysis

As noted above, the Consumer Advocate argues that there were three main underlying causes that contributed or may have contributed to the Power Outages: (1) the reaction of the electro-hydraulic control system low fluid level mercury switches to the earthquake's seismic vibrations and their relays locking out the system; (2) HECO's training programs for plant and system operators lacked formalized testing, practiced simulation, certification, re-qualification, and record keeping; and

³⁸See Final SOP at 50.

(3) HECO's specific generation mix, consisting primarily of steam turbine generators as opposed to quick-start CT generators, did not permit it to start its units to prevent the island-wide blackout and contributed to the length of the restoration period.

a.

Mercury Switches

On the Consumer Advocate's first issue related to the outage on Oahu, although phrased differently,³⁹ the Parties basically agree that the underlying cause of the outage was due to the seismic action of the earthquake triggering the mercury switches on Kahe 5 and 6. These mercury switches operate relays that prevented the electro-hydraulic system pumps on the units from restarting leading to the loss of power to (or tripping) Kahe 5 and 6. The record established in this proceeding is clear that the loss of Kahe 5 and 6, during this critical period, resulted in a "cascade" of events leading to the complete loss of power on Oahu. Thus, the commission agrees with the Consumer Advocate that the reaction of the mercury switches to the earthquake was an underlying cause that contributed to the Power Outage on Oahu. However, as the Consumer Advocate notes,

³⁹Specifically, HECO (and POWER) emphasized the earthquakes effect on the mercury switches while the Consumer Advocate (and Sega) stressed the reaction of the mercury switches to the earthquake. See HECO POWER Report at 81; CA's SOP at 10-11.

the reaction of the mercury switches and the activation of the lockout feature of the units was a "phenomenon [that] was not understood or expected by HECO."⁴⁰ As corrective measures, HECO disabled the original low level lockout feature while it retained the low fluid level alarms, replaced the mercury switches with dry contact switches and, among other things, are continuing discussions with manufacturers to seek alternative technologies to further mitigate the effects of earthquakes on their generating units. These actions also address POWER's recommendations related to HECO's electro-hydraulic pumps and mercury switches.⁴¹

b.

Training

Second, with regard to the HECO Companies' training programs, the commission generally disagrees with the Consumer Advocate's assessment. While the record at the time the Consumer Advocate submitted its statement of position may have supported its assertions, the record ultimately established in this case appears to contradict the Consumer Advocate's contention that the HECO Companies' training programs for plant and system operators are inadequate. Moreover, the Consumer Advocate's assertion that

⁴⁰See CA's SOP at 11.

⁴¹See HECO POWER Report 87; Final SOP at 26-28.

certain perceived deficiencies in the HECO Companies' training may have contributed to the outages on Oahu and Maui is not sufficiently supported.

In response to the Consumer Advocate's critique about their training programs, the HECO Companies provided, among other things, a detailed discussion of each company's training programs, numerous attachments documenting the depth and formality of their training procedures, and a supplemental briefing of their respective training regimens (i.e., the December 2007 Briefing) which was documented through a filing made on January 23, 2008. Nevertheless, in its Supplement, the Consumer Advocate maintains its initial position, that the HECO Companies' training programs for plant and system operators lacked formalized testing, practiced simulation, certification, re-qualification, and record keeping at the time of the earthquake and also maintains that "the lack of formalized training may have contributed to the HECO and MECO power outages and may have delayed the restoration of power on Oahu and Maui."⁴² The commission, however, disagrees. Rather than being inadequate, the record appears to generally demonstrate that the HECO Companies' training programs are extensive, thorough, formalized (as appropriate), dynamic, and geared towards

⁴²See CA's Supplement at 2.

the specific needs and realities (i.e., differing topography and populations served) of the electrical systems that evolved on each island. Moreover, training does not appear to have been a contributing factor in causing the outages.

For instance, certification requirements and record keeping of training appear to be satisfactory and consistent with recognized standards. The HECO Companies state that certifications and related training records are kept as part of the compliance requirements and are subject to unannounced inspections. To illustrate, the HECO Companies provided a list of certifications that are maintained regarding Power Supply processes as Attachment 38, of the Final SOP. However, with regards to power plant and system operators, the HECO Companies state that there are no applicable certification requirements for those job functions which, upon solicitation, the North American Electric Reliability Corporation confirmed.⁴³

The Consumer Advocate also takes issue with MECO's Production Department for not having a formal re-qualification program. While not formalized, MECO's Production Department personnel are provided refresher training through OJT provided by Shift Supervisors.⁴⁴ This form of training and qualification

⁴³See Final SOP at 64.

⁴⁴See Response to CA-IR-2028.

(or re-qualification, in this case) appears to be the general approach for every position in the LOP form of training, which provides, according to the HECO Companies, a practical, hands-on development and qualification to ensure that personnel attains the knowledge and experience necessary to operate the electrical systems during normal and emergency conditions. The Consumer Advocate's critique of this type of re-training provided to MECO Production Department personnel seems to be a general criticism of the HECO Companies' LOP/OJT method of training. This critique may be unfair given that while the Consumer Advocate recounts certain incidences wherein, with "hindsight," different decisions could have been made, the Consumer Advocate fails to provide specific evidence that the deficiencies that it identified are directly linked to the outages. It is also unclear whether any type of "formalized" training could have prevented the outages since, as the Consumer Advocate states, the "phenomenon" that led to the outage on Oahu was not understood or expected⁴⁵ and only a "very short window" existed for operators to react, which the Consumer Advocate also acknowledged.⁴⁶ Additionally, certain statements made by the Consumer Advocate appear to contradict its assertions regarding the HECO Companies' training programs.

⁴⁵See CA's SOP at 11.

⁴⁶Id. at 14.

For instance, subject to a caveat regarding the training programs, the Consumer Advocate asserts that the "HECO Companies' staff responded very well[.]"⁴⁷ Moreover, with regard to the second issue, the Consumer Advocate states that "the HECO Companies' activities and performance prior to and during the Power Outages were reasonable and in the public interest."⁴⁸ The commission believes that these statements are inconsistent with the Consumer Advocate's adopted opinion that deficiencies in the HECO Companies training programs were an underlying cause of the outages or contributed or may have contributed to it.

Furthermore, it appears that the HECO Companies recognize the importance of continuously improving their training efforts and, on their own, enhance their training programs, as the need arises. For example, as stated above, the HECO Companies have committed to implementing the recommendations set forth by POWER, which includes, for HECO, an evaluation of "black start procedures and training to account for equipment failure contingencies and communications across simultaneous units black starting" (i.e., POWER's HECO Recommendation No. 8). Under this recommendation, POWER states that HECO should consider, among other things, revising procedures, developing

⁴⁷Id. at 17 (emphasis added).

⁴⁸Id. at 21.

work flows, checklists, and contingency charts to reduce the possibility for operator errors and enhance coordination between plants. HECO has agreed to adopt this recommendation and has begun implementing it as documented on pages 34-36 of the Final SOP. Additionally, the HECO Companies state that in mid-2006 (prior to the Power Outage), as part of a reorganization of the Power and Supply Operation and Maintenance Department, HECO recognized and began addressing the need for more formalization of its training across the department. To this end, HECO added two new training positions and created a new Training Division in June 2006. Moreover, during the first part of 2005, HECO began plans to implement new technology that would improve how dispatchers operate their systems and, thus, hired KEMA Consulting to review its existing training program and recommend improvements. According to the HECO Companies, "System Operation now has a complete training cycle in place that will formalize and structure the approach to training and will validate the skills and knowledge of each dispatcher before they are conferred to assume the position of the Supervising Load Dispatcher, Load Dispatcher or Trouble Dispatcher."⁴⁹

⁴⁹See Final SOP at 80.

Given the above, the commission finds the Consumer Advocate's recommendation regarding training of plant and system operation personnel to be, at this time, unnecessary. However, to document and verify that updates to training are occurring pursuant to the HECO Companies' representations, the commission finds it reasonable to require the HECO Companies to submit updates to their training processes in an annual progress report to the commission which will be discussed further in Section II.C of this Decision and Order.

Moreover, with regard to the ODPM and IRM, the HECO Companies recognize that they were not updated and agree with the Consumer Advocate that those manuals should be reviewed annually and updated as appropriate. The HECO Companies represent that final revisions for the ODPM are scheduled to be completed by early 2008 and revisions to the IRM, which is also undergoing review, is slated to be completed by end of 2007. To complete the record with regards to this matter, the commission finds it reasonable to require the submittal of the updated and revised ODPM and IRM to the commission and the Consumer Advocate within thirty days of the date of this Decision and Order.

c.

Generation Mix

The Consumer Advocate's third contention that HECO's specific generation mix, consisting primarily of steam turbine generators as opposed to quick-start CT generators, did not permit it to start its units to prevent the island-wide blackout and contributed to the length of the restoration period appears to have merit. The Consumer Advocate states that HECO does not have quick starting units, aside from some small distribution generators, and that without such units (which can be brought on-line within a few minutes), HECO could not offset the capacity losses of the Kahe and Honolulu units that it experienced to prevent the island-wide outage. The HECO Companies do not appear to dispute the Consumer Advocate's claims.

The commission notes that while both HECO and MECO experienced island-wide outages, MECO (which has a system comprised mainly of diesel internal combustion engines and CTs) was able to restore service to most of its customers within five-to-six hours, as opposed to HECO (which is comprised of larger steam units) which required approximately nineteen hours to restore power to a majority of its customers. Thus, it appears that HECO's specific generation mix contributed to the outage experienced on Oahu.

Nevertheless, the Consumer Advocate does not recommend that HECO invest in quick starting units since, according to Sega, "a sufficient number of such quick starting units to counteract the loss of [HECO's steam units]. . . would likely prove to be an uneconomical generating mix for Oahu, given HECO's annual system load factors in the 70 percent range."⁵⁰ To address its concerns regarding quick starting capability, however, the Consumer Advocate recommends that HECO evaluate and pursue providing Waiau 9 and 10 CTs with black start capabilities (i.e., the Waiau Option). While agreeing with the intent of the Consumer Advocate's recommendation, the HECO Companies contend that the Kalaeloa Option, which was recommended by POWER, is the more feasible and sensible option. Upon review, the commission agrees with the HECO Companies.

In comparison with the Waiau Option, the Kalaeloa Option appears to be the more cost-effective and sensible choice. For instance, the estimated cost to implement the Waiau Option is approximately twelve times more costly than the Kalaeloa Option (\$2,150,000 as opposed to \$180,000). Moreover, among other things, under the Kalaeloa Option HECO would have the ability to restore power to its grid, upon a blackout, from four separate sites (i.e., Kalaeloa, CIP, Waiau, and Kahe stations) as opposed to three under the Waiau Option, providing HECO with

⁵⁰ See CA's SOP at 20.

greater flexibility and diversity to manage its system under critical conditions. Lastly, the commission notes that the Kalaeloa Option is basically implementation of POWER's HECO Recommendation No. 3 and that the Consumer Advocate has reviewed and agreed with all of POWER's recommendations regarding the HECO Companies.⁵¹ Accordingly, the commission finds that implementation of the Kalaeloa Option is the optimal solution between the two options, under the circumstances, and should be pursued over the proposed Waiau Option.

In sum, the commission concludes that the Power Outages were caused primarily by the earthquake of October 15, 2006, but that certain underlying factors, such as the mercury switches on HECO's Kahe 5 and 6, and HECO's generation mix, contributed or may have contributed to the outages. Moreover, the commission concludes that the HECO Companies shall provide a copy of the updated and revised versions of the ODPM and IRM to the commission and Consumer Advocate within thirty days of the date of this Decision and Order.

⁵¹Id. at 27.

B.

Were the activities and performances of the HECO Companies prior to and during the Power Outages reasonable and in the public interest? Specifically, were the power restoration processes and communication regarding the outages reasonable?

1.

Summary of Parties' Positions

a.

HECO Companies' Position

On the second issue of whether the activities and performances of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest, POWER states that they were. Specifically, with regard to HECO, POWER contends that staff acted reasonably, timely, and in the best interest of the public. Moreover, it notes that while with the "advantage of calm hindsight" there were few cases when different action could have been taken, it is not aware of "any case where actions could be described as imprudent or likely to cause injury, or damage."⁵² POWER states that system restoration after the outage was reasonable and executed well and that HECO's internal communication system operated adequately and did not hamper the restoration process.

⁵²See HECO POWER Report at 4.

With regard to HELCO, POWER states that HELCO personnel reacted to the circumstances in a reasonable, responsible, and professional manner. In its opinion, POWER states that it has not identified any instances for which it would offer an alternative action. POWER states that system restoration of HELCO's system was reasonable and well executed and that HELCO's internal communications worked well.

Finally, with regard to MECO, POWER states that personnel also acted reasonably, responsibly, and in a professional manner. While it notes two instances when responses could have been improved; in its opinion, these issues did not increase the time for restoring MECO's system. POWER notes that system restoration by MECO was reasonable and that it was well executed. POWER states that MECO's primary internal communications system failed due to lack of back-up emergency power sources. Nonetheless, POWER states that internal communication issues did not contribute to the outage or significantly hamper restoration since MECO utilized alternative forms of communications (i.e., a short wave radio system, external land-lines, and cellular phones).

Based on POWER's findings, the HECO Companies state that that their activities and performance prior to and during the Power Outages were reasonable and in the public interest:

- The respective systems were properly configured, staffed, and dispatched according to their respective operating procedures;
- The initial response to the earthquake was reasonable in trying to maintain the power systems in light of generation or transmission losses through the addition of generation and action of load shedding schemes;
- The manual trips of generation units were reasonable and in the public interest to protect the units from severe damage and to avoid prolonged outage;
- The restart and restoration plan to start generation units in parallel was reasonable and prudent to ensure startup in the shortest possible time[;]
- The incremental and methodical restoration of customer load in small increments was reasonable to avoid system overload; and
- The Companies' external and internal communications were reasonable and in the public interest.⁵³

b.

Consumer Advocate's Position

The Consumer Advocate concurs with POWER and the HECO Companies' assessment that the activities and performance of the companies prior to and during the Power Outage

⁵³See Preliminary SOP at 78-79.

were reasonable and in the public interest. Moreover, the Consumer Advocate states that "[g]iven the systems, plants, and staff in place on October 15, 2006, the power restoration processes and communication were reasonable in our opinion."⁵⁴

However, the Consumer Advocate contends that there were certain problems and delays which could have been avoided. First, the Consumer Advocate states that HECO could have generally recovered its system more quickly if like MECO; HECO had sixty-five percent of its distribution breakers controlled by dispatchers through the SCADA system. The Consumer Advocate notes that HECO "only" has remote control of ten percent of its distribution system circuit breakers.⁵⁵ It states that when HECO's CIP CT is added to its system, automated control over a larger portion of the distribution system would be beneficial. According to the Consumer Advocate, remote indication and actuation of distribution breakers would provide additional safety for HECO's field personnel. The Consumer Advocate, thus, recommends that HECO develop and commence a long-term program to implement SCADA control on existing distribution breakers and that the HECO Companies implement a standard requiring

⁵⁴See CA's SOP at 21.

⁵⁵However, the Consumer Advocates contends that "a higher level of automated control over distribution loads would not have shortened this particular recovery only because it took so long for HECO to black start generating units." See CA's SOP at 22.

SCADA control for all new distribution breakers that are installed for all three of its systems (collectively, the "CA's SCADA Recommendation").

Second, the Consumer Advocate asserts that critical equipment not connected to an uninterruptible power supply ("UPS") caused problems for MECO. On this matter, the Consumer Advocate states that MECO's SCADA system at its Maalaea power plant was not functional for a period of time and that MECO's Energy Management System ("EMS") at its dispatch center was "shut down" during the earthquake due to lack of back-up power. The Consumer Advocate notes that MECO has since temporarily installed a one MVA⁵⁶ UPS for its SCADA system and is installing UPS for its other critical circuits. The Consumer Advocate contends that "[b]ackup power supplies for all critical communications and control systems at each plant and each dispatch center throughout the HECO Companies must be assured through documented reviews, and periodic re-inspections in a preventive and predictive maintenance program."⁵⁷

Third, the Consumer Advocate contends that "it appears that the HECO Companies delayed, at least in part, their recovery from island-wide blackouts to comply with emissions limits in

⁵⁶"MVA" is the acronym for mega-volt amperes.

⁵⁷See CA's SOP at 23.

order to avoid potential enforcement actions by environmental agencies."⁵⁸ The Consumer Advocate states that while emissions limits are set to protect the public, the safe restoration of electric service as soon as possible is also in the public interest. Upon review of the Department of Health's rules governing air emissions, the Consumer Advocate contends that a policy decision has been made in favor of protecting the environment. However, it notes that the public must be advised that a policy to protect the environment may either hamper the utility's ability to preserve the system or may delay restoration of the system once it is shut down.

Finally, the Consumer Advocate notes certain problems encountered with regard to communications. For instance, on Oahu, keeping the public informed regarding the status of HECO's system was hampered due to different notification procedures,⁵⁹ and HECO needed to utilize alternative means to communicate since: (1) the back-up battery system of the phone provider for HECO's dispatch center ran down after six hours; and

⁵⁸Id. at 24.

⁵⁹The Consumer Advocate states that unlike the Emergency Operations Centers ("EOCs") on the islands of Hawaii and Maui, the EOC on Oahu did not relay information regarding the status of the system provided by HECO to KSSK, the Emergency Broadcast Station on Oahu. The Consumer Advocate notes that a HECO representative was sent to KSSK to directly provide system updates.

(2) service from HECO's primary wireless phone provider was unavailable for several hours. With regards to MECO, the Consumer Advocate stated that MECO's communications with representatives at Maui's EOC was hampered due to congested phone lines and inferior cell phone reception since the EOC on Maui is located in the basement of the Maui County Building.

c.

HECO Companies' Response

In their Final SOP, the HECO Companies state that they concur with the Consumer Advocate's statement that their activities and performance prior to and during the Power Outages were reasonable and in the public interest.⁶⁰ However, with regard to the Consumer Advocate's recommendation regarding SCADA, the HECO Companies propose an alternative. While agreeing with the underlying intent and objective of the Consumer Advocate's recommendation and recognizing that there is an incremental benefit of having increased SCADA control when recovering from an island-wide outage, the HECO Companies contend that the benefits may not be significant on a going forward basis and that they must be weighed against the associated benefits to customers. Thus, consistent with the intent of the CA's SCADA Recommendation, they offer that an effort to design and construct

⁶⁰See Final SOP at 5.

all new distribution substations to be "SCADA ready" (or "SCADA enabled") is in the best interest of their ratepayers and reaffirms its commitment to continue its long-standing approach of carefully weighing the costs and benefits of implementing SCADA control on existing distribution breakers (collectively, "Strategic SCADA Implementation").⁶¹

According to the HECO Companies, the Strategic SCADA Implementation approach rather than the CA's SCADA Recommendation is in the best interest of ratepayers and more appropriate since: (1) SCADA controlled distribution load is already strategically implemented in the immediate area of power plants with black-start capability; (2) a substantial amount of load (290 MW) is already remotely controlled at the distribution circuit level; (3) there is full remote control of all customer load island-wide at the forty-six kilovolts ("46kV") circuit level through the EMS; (4) black-start capability is being planned for quicker starting of the CIP CT in 2009; (5) HECO is committed to continue on-going efforts with Kalaeloa to jointly assess and implement, if feasible, Kalaeloa's CTs as a second source of quick-starting generation for grid restoration (see POWER's HECO Recommendation No. 3); and (6) HECO is continuing its efforts to determine the best order for generator start-up and load restoration

⁶¹Id. at 7.

following an island-wide blackout (see POWER's HECO Recommendation No. 7).

Moreover, with regard to the practice of installing SCADA, the HECO Companies assert that HECO has essentially adopted the practice (shared with HELCO and MECO) that "all new distribution substations using a standard transformer and switchgear be designed and built "SCADA ready" although not necessarily "SCADA enabled" from the outset."⁶² This practice is, according to the HECO Companies, a calculated and fiscally responsible approach to the investment of limited resources since cost for SCADA capability at a new or existing substation can vary greatly, estimated from a low of \$60,000 to a high exceeding \$15 million.⁶³ For example, it notes that the communication costs to enable SCADA at HECO's Ocean Pointe substation was approximately \$60,000 which is relatively small in comparison to the entire cost of the project of approximately \$1.73 million. However, HECO decided to make its Mokuone substation "SCADA ready" as opposed to "SCADA enable" since cost of SCADA capability for this substation was estimated to be \$600,000 which would have added a forty percent premium to the total cost of the project of \$1.42 million. The HECO companies argue that a broad standard, as recommended by the Consumer Advocate,

⁶²Id. at 59-60 (emphasis in original).

⁶³Id. at 58.

requiring SCADA control for all new distribution breakers is not necessary or fiscally prudent; and that their current approach more carefully weighs the cost and benefits of SCADA implementation and is more appropriate and in the best interest of its customers.

2.

Analysis

As noted above, the Parties agree that the activities and performance of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest. However, the Parties disagree with respect to the extent of SCADA implementation that should be required.

a.

Acted Reasonably and in the Public Interest

Upon review, the commission finds that the record of this proceeding reveals that the activities and performance of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest. While certain difficulties appeared to have arisen during the Power Outages, some of which are noted and discussed above, there is no indication that the HECO Companies' actions prior to and during the outages were unreasonable, imprudent, or detrimental

to the interest of the public. POWER, the HECO Companies' experts, determined that the companies were in proper operating conditions and were appropriately staffed when the earthquake struck. In POWER's opinion, personnel of the HECO Companies acted reasonably, responsibly, and in a professional manner; and the respective restoration plans of the companies were reasonable, under the circumstances, and well executed. The Consumer Advocate's independent expert, Sega, agreed with POWER's assessments.⁶⁴ In addition, given the circumstance that existed on October 15, 2006, the power restoration processes and communications were, in Sega's opinion, reasonable.⁶⁵

As noted above, certain difficulties arose during the Power Outages. For instance, on Maui, MECO's SCADA system was not operational for a period of time since it was not connected to an UPS and due to the same issue MECO's dispatch center was also negatively impacted. Also, HECO and MECO appear to have experienced communications-related problems mainly due to intermittent service and poor reception from primary telecommunications equipment and networks. The HECO Companies appear to have responded to these communication problems through the use of alternative methods of communications (i.e., two-way radios, cell phones, and external land-lines)

⁶⁴See CA's SOP at 21.

⁶⁵Id.

as applicable. Certain challenges also appeared to have occurred during the restoration processes which were overcome and do not appear to have significantly delayed the restoration of the systems. For example, according to POWER, the trip of the Kahului black start generator due to overload issues did not affect the duration of the outage on Maui,⁶⁶ and the early trips of Maalaea diesel units 5 and 6 due to loading issues added approximately fifteen minutes to the overall restoration time.⁶⁷ Moreover, it appears that the difficulties experienced by each of the HECO Companies have or are being addressed through the implementation of POWER's recommendations.⁶⁸

b.

SCADA

With regards to SCADA, the commission finds the HECO Companies' Strategic SCADA Implementation approach preferable to the CA's SCADA Recommendation. First, it appears that HECO already has remote control over a significant portion of its system. According to the HECO Companies, HECO's dispatch center currently has "remote operation of all 138kV and 46kV transmission and sub-transmission breakers on its system"

⁶⁶See MECO POWER Report at 51.

⁶⁷Id. at 53.

⁶⁸See Final SOP at 26-42.

which provides service to approximately 292,779 of Oahu's customers.⁶⁹ Additionally, HECO asserts that its dispatch center has direct remote operation capability over approximately ten percent of its 455 distribution circuits on Oahu which provides power to about twenty-three percent of the island peak load demand, or approximately 290MW. Second, the overall intent of the CA's SCADA Recommendation to restore service to customers more quickly after a blackout⁷⁰ can be satisfactorily addressed through other means including, but not limited to, the planned implementation of black-start capability for the quicker CIP CT and HECO's efforts with Kalaeloa to implement, if feasible, the use of its CTs for grid restoration. Third, the cost of deploying SCADA capability to new and existing substations, estimated to range between \$60,000 to over \$15 million,⁷¹ can be daunting and may not be cost effective under certain circumstances. For instance, according to HECO the cost estimate to retrofit an existing "non-SCADA ready" switchgear is approximately \$190,000 while it would cost roughly \$280,000 to replace the entire switchgear with a new "SCADA ready" switchgear.⁷² Finally, as the Consumer Advocate notes,

⁶⁹Id. at 50 (emphasis in original).

⁷⁰See CA's SOP at 22.

⁷¹See Final SOP at 58.

⁷²Id. at 56.

a higher level of automated control over distributed loads would not have shortened the recovery of the HECO system in this case.⁷³ Accordingly, the commission finds the CA's SCADA Recommendation to be unwarranted and inappropriate, under the circumstances; and the commission agrees that the HECO Companies' current Strategic SCADA Implementation approach is reasonable, appropriate, and in the public interest. Nonetheless, the commission believes that deployment of SCADA control is important and can be beneficial. Thus, the commission finds it reasonable to require the HECO Companies to provide a detailed discussion regarding the reasonableness and feasibility of incorporating SCADA capability in all applications for approval of capital improvement projects regarding the construction and replacement of substations,⁷⁴ on a going forward basis. Moreover, in the annual progress report which will be discussed below, HECO should report to the commission regarding SCADA implementation, including penetration at the distribution levels, as well as the costs and

⁷³See CA's SOP at 22.

⁷⁴On this matter, the commission recognizes that in Docket No. 03-0257, the commission increased the monetary threshold governing the filing of capital expenditure applications by the HECO Companies, from \$500,000 to \$2.5 million, exclusive of customer contributions, effective July 1, 2004. See Decision and Order No. 21002, filed on May 27, 2004.

benefits where SCADA is implemented and quantification of any factors that were considered for each new distribution substation where SCADA control either was or was not implemented.

Based on the foregoing, the commission concludes that the activities and performance of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest. In addition, the commission concludes that the restoration processes and communications regarding the outages, under the circumstances, to also be reasonable. The commission further concludes that the HECO Companies, on a going forward basis, should be required to provide a detailed discussion regarding the reasonableness and feasibility of incorporating SCADA capability in all applications for approval of capital improvement projects regarding the construction and replacement of substations and submit a report on SCADA implementation, as discussed above.

C.

Could the island-wide Power Outages on Oahu and Maui have been avoided? What are the necessary steps to minimize and improve the response to such occurrences in the future?

The third issue is whether the island-wide Power Outages on Oahu and Maui could have been avoided. According to the HECO Companies, the island-wide outages on Oahu

and Maui could not have been avoided.⁷⁵ In short, with regard to Oahu, the underlying cause of the outage was the earthquake tripping the electro-hydraulic fluid level switches which caused the pumps to lockout leading to the loss of Kahe 5 and 6 which ultimately caused the island-wide outage on Oahu. Regarding the island-wide outage on Maui, the HECO Companies state that it was unavoidable given the loss of Maalaea units 14 and 16. According to the HECO Companies, the vibration trips of Maalaea units 14 and 16 were valid to protect the equipment. Loss of these units led to the triggering of the automatic load shedding schemes which ultimately resulted in the island-wide outage on Maui.

In its various reports, POWER provided recommendations to assist in mitigating the risk of similar recurrences in the future. The HECO Companies state that they are actively addressing POWER's recommendations and each are implementing other practical system improvements and operating practices that are best suited to meet the unique needs and circumstances of each island grid. As noted above, POWER's recommendations and the HECO Companies' responses with respect to each recommendation are set forth on pages 26 through 42 of the Final SOP.

⁷⁵See Preliminary SOP at 39 and 72.

The Consumer Advocate states that given the circumstances, the Oahu island-wide outage was an understandable outcome and that the island-wide outage on Maui was unavoidable. With regards to Oahu, however, Sega, the Consumer Advocate's expert, contends that the outage on Oahu may have been avoided "if the Electro-Hydraulic Control lockout relay features on Kahe 5 and 6 had been known and modified to prevent the potential for false lockout in significant seismic events."⁷⁶ It is Sega's opinion that the island-wide outage on Maui was unavoidable since the generators were automatically and directly tripped off by their own protective controls due to the seismic vibrations and there was insufficient time to save the system by starting other units.

The Consumer Advocate states that Sega reviewed POWER's recommendations set forth in the various reports and concurs with each of them. Moreover, the Consumer Advocate recommends that the HECO Companies be required to implement certain additional measures to minimize and improve their responses to similar occurrences. The additional measures recommended by the Consumer Advocate were discussed and addressed in the appropriate sections above.

⁷⁶See CA's SOP at 26-27.

Based on the record established in this proceeding, the commission finds that the island-wide outages on Oahu and Maui, under the circumstances, could not have been avoided. The events leading to the outages are well documented by the Parties in this proceeding and summarized above. The Parties and their respective experts all concur that the island-wide outages could not have been avoided, given the circumstances that existed on October 15, 2006. While the commission agrees with Sega that had HECO known and addressed the electro-hydraulic control lockout features on Kahe 5 and 6, the island-wide outage may have been prevented, the record is clear this was not the case. As the Consumer Advocate noted, the reaction of mercury switches and related lockout features was a "phenomenon [that] was not understood or expected by HECO."⁷⁷

The commission also finds the HECO Companies' adoption of the various recommendations proposed by POWER to be reasonable and appropriate. POWER's recommendations address specific difficulties experienced by the HECO Companies during the island-wide and partial outages and were crafted to mitigate the risk of future occurrences under similar situations. The HECO Companies state that they have already taken measures to implement POWER's recommendations in an effort to improve "reliability, increase restoration flexibility, and improve

⁷⁷Id. at 11.

restoration capabilities when faced with similar major external system disturbances."⁷⁸ The Consumer Advocate has reviewed and concurs with POWER's recommendations for each of the companies.⁷⁹ The record in this docket indicates that implementation of POWER's recommendations for the HECO Companies, as set forth in its various reports, would minimize and improve the response to similar occurrences in the future. Accordingly, the commission finds the adoption of POWER's recommendations by the HECO Companies to be reasonable and in the public interest.

In addition, the commission finds it reasonable and appropriate to require the HECO Companies to provide an update with regards to their implementation of POWER's recommendations and any other measures taken to minimize and improve their respective responses to similar future occurrences in an annual progress report which was initially described above regarding the HECO Companies' training program updates ("Progress Report"). The first report should be submitted to the commission on April 1, 2009, and subsequent reports should be filed on the same day for the next three years thereafter, unless ordered otherwise by the commission. The Progress Report should discuss in detail the HECO Companies implementation of POWER's recommendations and other measures taken to minimize and

⁷⁸See Final SOP at 3-4.

⁷⁹See CA's SOP at 27.

improve their respective responses to similar future occurrences; updates to their training programs, including black-start training exercises for all three of the utilities; and SCADA implementation as discussed in Section II.B, above.

Based on the foregoing, the commission concludes that the island-wide power outages on Oahu and Maui could not have been avoided and that the HECO Companies' adoption of POWER's recommendations is reasonable and in the public interest. Moreover, the commission concludes that the HECO Companies should be required to submit a Progress Report annually, as described above.

D.

What penalties, if any, should be imposed on the HECO Companies?

The final issue is whether any penalties should be imposed on the HECO Companies. The HECO Companies assert that no penalties should be imposed on them since they acted reasonably, responsibly, and in the public's interest in response to the earthquake, the ensuing outages, and during the restoration processes. They state that there is no basis for the imposition of penalties in this case. Moreover, the HECO Companies contend that any penalty would not advance

the public's interest since they are already committed to improving their operations and systems as recommended by POWER.

The Consumer Advocate recommends that no penalties be imposed on the HECO Companies for these "uncommon" island-wide outages. The Consumer Advocate states that "[t]he HECO Companies, their employees and management staff should be commended for their determined efforts to prevent the outages and restore electric service as safely and quickly as possible under the circumstances."⁸⁰ The Consumer Advocate also asserts that any "shortcomings" identified in its SOP were not intentional and can be corrected through training and system improvements.⁸¹ Among other things, the Consumer Advocate states that "[w]hen evaluated in hindsight, actions taken during an unprecedented time of crisis should not be the cause for corporate penalties, especially when the actions appeared to be consistent with the employees' training received and driven by their desire to preserve their units for the long-term."⁸² Further, rather than penalizing them, the Consumer Advocate states that management of the HECO Companies should be encouraged to make improvements in the areas of training, system automation, and emergency preparedness. However, the Consumer Advocate

⁸⁰Id. at 28.

⁸¹Id. at 29.

⁸²Id.

states that good cause for imposition of penalties may exist after any similar outage if the HECO Companies fail to learn from this situation and do not appropriately implement recommended measures.

Upon review, the commission finds that imposition of penalties in this case to be unwarranted. As the commission determined, the actions and performances of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest. This determination is based on the record established in this proceeding. Moreover, the record indicates that the island-wide outages on Oahu and Maui were, under the conditions that existed on October 15, 2006, unavoidable. While it appears that certain shortcomings and problems arose during the outages and recovery processes, as described above, they were understandable under the circumstances. As the Consumer Advocate noted, the shortcomings it identified were not intentional and are correctable.

Based on the foregoing, the commission concludes that penalties should not be imposed on the HECO Companies with regards to the Power Outages.

III.

Orders

THE COMMISSION ORDERS:

1. The activities and performance of the HECO Companies prior to and during the Power Outages were reasonable and in the public interest.

2. No penalties are imposed on the HECO Companies with regards to the Power Outages.

3. Within thirty days of the date of this Decision and Order, HECO shall provide a copy of its updated and revised versions of the ODPM and IRM to the commission and Consumer Advocate.

4. The HECO Companies, on a going forward basis, shall provide a detailed discussion regarding the reasonableness and feasibility of incorporating SCADA capability in all applications for approval of capital improvement projects regarding the construction and replacement of substations.


5. Beginning on April 1, 2009, and annually for the next three years thereafter, the HECO Companies shall submit to the commission a Progress Report as discussed in Section II.C of this Decision and Order. The same shall be served on the Consumer Advocate.

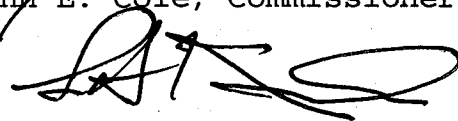
6. Unless ordered otherwise, this docket shall be deemed closed upon the HECO Companies' compliance with ordering paragraphs nos. 3 and 5, above.

DONE at Honolulu, Hawaii DEC 19 2008.

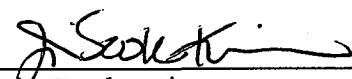
PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

By 
Carlito P. Caliboso, Chairman

By 
John E. Cole, Commissioner


By Leslie H. Kondo, Commissioner

APPROVED AS TO FORM:


Ji Sook Kim
Commission Counsel

2006-0431.laa

CERTIFICATE OF SERVICE

The foregoing order was served on the date of filing by mail, postage prepaid, and properly addressed to the following parties:

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